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arations. It has been well translated by Dr. Schober, and is clearly illustrated.

E. RENOUF.

Laboratory Exercises in General Chemistry.

Compiled from various sources by G. W. SHAW, A.M., formerly Professor of Chemistry at Oregon State Agricultural College. For use in connection with Storer and Lindsay's 'Manual of Chemistry.' New York, American Book Company. Pp. 63.

This book is better than most of its class. A generally valid objection to the use of laboratory books instead of the text-book is that they enable a student to perform an experiment without thought of the principle which it illustrates. Such objection cannot be made to this book, for each exercise contains many questions requiring verbal answer to the instructor or written answer in the laboratory note-book.

E. RENOUF.

The Elements of Qualitative Analysis. By

WM. A. NOYES, Ph.D., Professor of Chemistry in the Rose Polytechnic Institute. Fifth edition, revised. New York, Henry Holt & Company. 1901. Pp. 101.

In this new edition of his excellent and well-known manual, Professor Noyes introduces and expands the method of Abegg and Herz for the systematic detection of acids. He divides the acids into eight groups, using as reagent for group 1 concentrated sulphuric acid; for groups 2, 3 and 4 calcium chloride, barium chloride and zinc chloride respectively in neutral solution; for group 5, color reaction with ferric chloride; group 6, silver nitrate; group 7 contains the acids whose calcium, barium, zinc and silver salts are soluble; and group 8, the commoner organic acids which carbonize on heating. This method seems simple and little open to error.

E. RENOUF.

SOCIETIES AND ACADEMIES.

THE CHICAGO SECTION OF THE AMERICAN
MATHEMATICAL SOCIETY.

THE eleventh regular semi-annual meeting of the Section was held at the University of Chicago, on Saturday, March 29, the first ses-

sion opening at 10 o'clock A.M. At the morning session Professor Townsend, of the University of Illinois, and at the afternoon session Professor Moore, President of the Society, occupied the chair. The following papers were read:

Morning Session.

Nachtrag zum Artikel: 'Zur Erklärung der Bogenlänge,' u. s. w.: Professor O. STOLTZ, Innsbruck, Austria.

'The Mutual Independence of Hilbert's Axioms within the Various Groups': Mr. ARTHUR T. BELL, University of Illinois.

'On the Superosculation of Surfaces': Professor H. MASCHKE, University of Chicago.

'A Certain Conic connected with the Isotomic Relation': Professor LAENAS G. WELD, University of Iowa.

'Concerning the Second Variation in the Isoperimetric Problem': Professor O. BOLZA, University of Chicago.

'Concerning the Isoperimetric Problem on a Given Surface': Professor BOLZA.

Afternoon Session.

'Some Remarkable Cases of Libration among the Small Planets of the Hilda Type': Professor KURT LAVES, University of Chicago.

'On the Interchange of the Order of Differentiation': Professor E. J. TOWNSEND, University of Illinois.

'On the Group Defined for Any Given Field by the Multiplication Table of Any Given Finite Group': Professor L. E. DICKSON, University of Chicago.

'Theorems on the Residues of Multinomial Coefficients with respect to a Prime Modulus': Professor DICKSON.

The committee appointed at the last meeting of the Section to consider and report a scheme of equivalent requirements for the Master's degree, for candidates making mathematics their major subject, presented a preliminary report which was discussed and ordered to be manifolded for distribution among the members of the Society. The report is in the hands of the secretary of the Section and a copy will be sent to any members applying for it.

THOMAS F. HOLGATE,
Secretary for the Section.

NEW YORK ACADEMY OF SCIENCES.

SECTION OF BIOLOGY.

At a regular meeting of the Section on March 10, the following program was offered:

'The Four Phyla of Titanotheres': HENRY F. OSBORN.

'The Early Development of Sharks from a Comparative Standpoint': BASHFORD DEAN.

'The Cytological Phenomena of Maturation and First Cleavage in the Cirriped Egg': MAURICE A. BIGELOW.

'The Effect of the Wind on Bird Migration': C. C. TROWBRIDGE.

Professor Osborn presented some results recently obtained for a U. S. Geological Survey Monograph. The Lower Oligocene Titanotheres prove to belong to four distinct phyla, to which the prior generic names *Titanotherium*, *Symborodon*, *Megacerops* and *Brontotherium* may be applied. The chief distinctions are found to be in the dolichocephalic or brachycephalic form of the skull, in the shape, length, position and mechanical relations of the horns, and in the number and form of the incisor and canine teeth. Each genus obviously had distinctive modes of fighting, locomotion and feeding. *Titanotherium* extends from the base to the summit of the Lower Oligocene. It is distinguished by its long narrow skull, short horns, powerful canines, vestigial incisors. *Megacerops*, on the contrary, is broad-skulled, short-horned, with obtuse canines, and with at least one upper incisor. *Symborodon* is distinguished by the narrowing of the anterior portion of the premaxillaries, reduction of all the anterior teeth, and by elongate horns placed immediately over the eyes. In *Brontotherium*, the horns are by far the largest and most powerful, and acquire an extreme anterior position, absorbing the free portion of the nasals; all the upper cutting teeth persist; great buccal plates are evolved; and the skull measured along the base line is extremely brachycephalic. The four types were illustrated by models and diagrams.

Professor Bashford Dean considered briefly some points in the development of sharks, and attempted to reduce the type of the early development of the recent types to that of their

holoblastic ancestor. This form probably occurred within the strict limits of the group Elasmobranchii—for the absence of clasping organs in the palæozoic genera of Acanthodians and Cladoselachids predicates external fertilization, and eggs many in number and of small size. In the line of this comparison, reference was made to the early development of the Japanese 'pavement-toothed' shark, *Cestracion japonicus*, in which, as the author showed in a recent number of the 'Annotiones Zoologicæ,' surface furrows are present, traversing the yolk, and are best interpretable as reminiscent of holoblastic cleavage. In the peculiar type of early development in *Chimæra*, total cleavage is suppressed until about the time of gastrulation, when cleavage furrows appear in the region of the lower pole and come to divide the egg into a number of distinct blastomeres, only one mass of which, however, become enclosed in the yolk-sac of the embryo. The remaining blastomeres, by a process of continued division, provided nutriment for the embryo *via* gills and gut. Dr. Dean announced the presence in *Chimæra* of a true archenteric invagination, occurring early and at some distance from the margin of the blastoderm. It is small in size, and has a distinct cellular floor. Its (anterior) dorsal wall was compared to the dorsal lip of the archenteron of sharks, as described by Rückert and others. The ventral wall of the archenteron of modern types of sharks has thus lost its cellular character during the process by which the embryo acquired a more perfect and specialized (cænogenetic) mode of obtaining nourishment from the yolk.

The paper by Dr. Bigelow dealt chiefly with protoplasmic movements and associated displacements of the yolk materials in various cirripede eggs during maturation and first cleavage. The telolecithal distribution of the egg substances, the formation and disappearance of a yolk-lobe, and precleavage movements associated with differential distribution of the entoblastic materials were described. Finally, a turning of the first cleavage spindle from a transverse to an oblique axis of the ellipsoidal egg was compared with similar more extensive movements in nematode eggs.

Mr. C. C. Trowbridge presented the results of systematic observations on the effect of the wind on the migration of hawks and many other birds along the Atlantic coast. The principal points of the paper were illustrated by means of diagrams giving the directions taken by the migrating birds under the influence of different winds. It was shown that a knowledge of meteorology was necessary in considering this subject, because the effective winds depend on storm centers traveling eastward. In one case, in the height of the southward migration, a storm center off the coast of Maine caused northerly winds throughout 800,000 square miles in the eastern part of the United States and Canada, the velocity of the wind area averaging twenty miles per hour. A former paper on the subject was briefly reviewed, in which the author showed that flights of hawks and other land birds during the migrations were due to the crowding of the birds in a narrow coast-line path by the wind. The recent observations now warrant the conclusion that hawks and many other birds regularly depend on a favorable wind as a help in their migratory movements, and, as a rule, migrate only when favorable winds occur. A brief account was given also of a retrograde movement of migrating swallows in the spring, evidently due to a return flight of the birds after they had been blown far out of their course by a strong wind from the west.

HENRY E. CRAMPTON,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

A MEETING was held on March 28, Professor Farrand in the chair. The present sectional officers were reelected for the ensuing year.

Dr. Clark Wissler reported on the growth of boys. The annual physical measurements of some three hundred schoolboys were correlated to discover tendencies and directions of growth. It appeared from the data that growth was rather uniform, as for example, when a boy's legs were growing rapidly his arms were also growing at a corresponding rate. By correlating the stature with its increment for the following year it was

seen that the sign of correlation changes when the pubertal maximum of growth is crossed. This means that boys who are growing rapidly at twelve, for example, continue to grow rapidly until fourteen or fifteen, when they slow down, while those growing slowly before this period now grow rapidly. Thus it appears that the point of pubertal maximum rate of growth, as determined by mass measurements, is really the point dividing the boys who mature early from those who mature late. The relation is yet more in evidence when the annual increments are correlated without regarding the absolute measurements. The results as a whole seem to show that the rate of growth in any particular year is of no special significance except as an index of the relative maturity of the individuals concerned.

Mr. W. S. Kahnweiler reported on a trip that he made last summer through French Indo-China to the Angkor Wat. His paper was illustrated with lantern views of the trip, and of the architecture and sculpture of the ancient temple. The history of the temple was briefly outlined.

R. S. WOODWORTH,
Secretary.

TORREY BOTANICAL CLUB.

At the meeting of the Club on March 11, 1902, the first paper, by Edward S. Burgess, was on 'Plant Illustration in the Middle Ages,' being a portion of a contribution to the history of early botany soon to be printed among his 'Aster Studies.' The paper was illustrated by examples from his library, of early woodcuts intended to represent *Aster*, dated 1485, 1499, etc. (long anterior to the first adequate drawing of *Aster*, that of Fuchs in 1542); also examples of the value once put upon the vellum used for manuscripts, showing an Italian manuscript dating perhaps from before 1200, in which torn vellum had been carefully mended before writing. He also exhibited a series of heliotypes representing about twenty-five pages of unpublished mediæval manuscript containing drawings of plants, and nearly as many pages more of decorated text, photographed by Professor

Giacosa, of Turin, to accompany his recent edition of certain of the Salernitan masters ('Magistri Salernitani,' Turin, 1901).

Early plant drawings give their chief attention to outline; particularly of leaves, stem and branches. Flowers were less often and less successfully indicated. The characteristic *habit* of a plant, however, was often caught very perfectly. Figures were copied often with scrupulous care from one manuscript to another. Several causes tended, however, to their degeneration. Pliny charges the blame for the imperfect plant-figures of his time upon lack of skill of copyists. Some of the worst among later errors were those of copyists who had never seen the plant and who were attempting copies of plants of distant regions as in early Anglo-Saxon figures of *Aster* and other classic plants. In other copyists a desire for balance and symmetry overcame their fidelity to the original, so that they conventionalized their plants; as seen strongly in later Italian work exhibited, developed in the fourteenth century from the Salernitan school; and as retained in early printing, Italian woodcuts of 1499 inheriting the same tendency. A fourth source of error in plant-figures was the mediæval love of the marvellous, so that many copyists outdid their text in depicting fictitious monstrosities, as in the fifteenth century pictures of mandrakes, Tartarian lamb, etc.

Some of the earliest plant-figures of which we know were those made by Cratevas, Greek physician to Mithridates, about 100 B.C. Something of their character and form probably still survives to us in certain illustrated manuscripts of Dioscorides, of the fifth century, with figures evidently copied, not from each other, but from an earlier common source. There is great need in the interests of the history of botany, that the project of publishing the figures of the Anician Vienna codex, now laid aside for nearly two centuries, should be revived and carried to successful issue. In the discussion following this paper Dr. Britton, Dr. Underwood, Professor Lloyd and Mr. Eugene Smith participated.

The second paper was by Mr. W. A. Cannon, entitled 'Observations on the Structure

of the Ovular Integuments of *Dichelostemma capitatum*.' Colored figures were shown, indicating the final absorption of the inner integument by the developing endosperm. The haustoria of the mistletoe penetrate the oak cortex by secreting a ferment which dissolves the neighboring cell walls; excepting certain lignified cells which become incorporated in the haustoria. So also in this liliaceous plant, better known to many as *Brodiaea*, the haustorial enzyme is unable to dissolve the cuticularized membrane of the integument. Possibly such cases of absorption of non-dissolved cuticularized membrane may be widespread.

Professor Lloyd in discussion suggested that different parts of the ovule may be able to secrete different kinds of enzymes, ready to attack different kinds of tissues simultaneously; at least three different enzymes have been obtained by mechanical means from the yeast-plant. In certain of the Rubiaceæ the formation of enzymes in the megaspore antedates fertilization; and that the pollen-tube develops an enzyme is well known.

The final contribution of the evening was by Dr. N. L. Britton on the 'Morphology of the flower of *Dichondra*,' a plant commonly assigned to the Convolvulaceæ. Its little rotate flowers resemble a saxifrage and are highly incongruous with the Convolvulaceæ.

EDWARD S. BURGESS,
Secretary.

NORTHEASTERN SECTION OF THE AMERICAN
CHEMICAL SOCIETY.

THE regular monthly meeting of the Section was held on Wednesday, March 26. Professor H. W. Conn, of Wesleyan University, presented an interesting paper on 'Some Aspects of Commercial Bacteriology.' The early history of the use of butter cultures in Denmark was reviewed, and the successful use of the cultures in that country was attributed to the law passed by the government requiring all cream used in making butter to be Pasteurized. This produces a mild butter with the flavor characteristic of the pure culture used. In this country such a mild butter has not met with ready sale, and if the cream has been

Pasteurized, it is possible to produce only a mild butter. In order to procure the more pronounced flavor as desired here, the cream is allowed to ripen and a 'starter' removed for the following day. In this way butter having a characteristic flavor may be produced without the use of a pure culture. Professor Conn believed that the ripening of cream takes place in two stages; the first being the rapid growth of certain albumen-destroying bacteria; and the second, the rapid growth of lactic-acid-producing bacteria. In completely ripened cream the latter only are present and constitute the pure Danish cultures which give mild butter. The former seem to be the cause of the stronger flavor desired in America. They do not affect the flavor of the Danish butter, as they are all destroyed in the process of Pasteurization. It is interesting to note that pure cultures are used in this country to a greater extent by the producers of oleomargarine and 'process' butter than by the dairymen.

The second paper of the evening was read by Mr. S. C. Prescott, of the Massachusetts Institute of Technology, who gave an interesting review of 'The Nature of Enzyme Reactions.'

HENRY FAY,
Secretary.

ONONDAGA ACADEMY OF SCIENCE.

THE 54th regular meeting of the Academy was held in the Historical Rooms, March 21, 1902.

Dr. Charles W. Hargitt spoke on 'Bird Migrations and Food Habits,' emphasizing the remarkable exactness in time with which certain of the birds annually arrive. The time, manner and causes of migrations were fully discussed. In speaking of the 'Food Habits' of birds, Dr. Hargitt pleaded for a fair balancing of the results found in the analyses of the stomach contents, as a single berry *vs.* the harmful insects destroyed, and accentuated the importance of avoiding prejudices.

Professor G. A. Bailey spoke of the 'Traits of Birds,' mentioning the cowbird as a case of degeneration. It was gradually giving up

nest-building and becoming more slovenly, as was also true for the American cuckoo. He also spoke of the difference in the shape of birds' eggs and suggested that it was due largely to differences in the kind of nests.

P. F. SCHNEIDER.

SYRACUSE, N. Y.

THE NEW YORK ASSOCIATION OF BIOLOGY TEACHERS.

THE second regular meeting of the Association for 1902 was held in the Board of Education building, on Friday evening, April 4. There was a general discussion on the subject of 'Field Work,' introduced by Miss Kate Burnett Hixon and Miss Mary D. Womack.

G. W. HUNTER, JR.,
Secretary.

DISCUSSION AND CORRESPONDENCE.

AN AMERICAN JOURNAL OF PHYSICS.

I AM not aware whether any discussion has been published, but it must have been keenly felt by everybody associated with the physical sciences, at least, that one of the important issues in the near future is the systematization and consolidation of the journals of American science. It seems to me that what we need is a clearing house or, better, a trust of American research literature, and the pooling in the present instance will be all the more justifiable as it will be nearly pure altruism. Few of the higher order of journals—I mean those which offer non-popular scientific articles—really pay. Many of them are conducted at a loss. Perhaps for this very reason some plan of amalgamation may be feasible.

In physics the conditions* are in every way deplorable. Much, perhaps most, of our best work goes out of the country, with the result that American journals, being in a sense superfluous to the foreigner, are but little read abroad. I have no statistics; what I state are merely the convictions of more or less desultory observations; but I am afraid they are even regarded with just a little superciliousness at home.

* Much to the same effect might be said of chemical and of geological journals, though I naturally shrink from it.